

REMARKS

INTRODUCTION

Claims 1-24 were previously [and are currently] pending and under consideration.

Claims 25-30 are added herein.

Therefore, claims 1-30 are now pending and under consideration.

Claims 1-24 are rejected.

Claims 1, 4, and 21 are amended herein.

No new matter is being presented, and approval and entry are respectfully requested.

REJECTIONS UNDER 35 USC § 112, SECOND PARAGRAPH

In the Office Action, at page 2, claim 4 was rejected under 35 U.S.C. § 112, second paragraph, for the reasons set forth therein. Claim 4 has been amended for improved clarity. Withdrawal of the rejection is respectfully requested.

REJECTIONS UNDER 35 USC §§ 102 AND 103

In the Office Action, at pages 2-7, claims 1-4 and 20-24 were rejected under 35 U.S.C. § 102 as anticipated by Russo. Claims 5-19 were rejected as obvious over Russo in view of various other references. These rejections are traversed and reconsideration is requested.

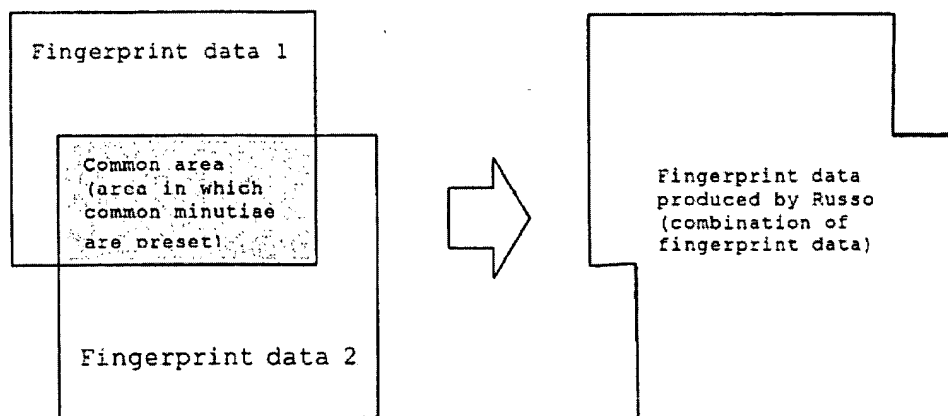
RUSO'S COMMON MINUTIAE ARE USED TO ALIGN FINGERPRINT DATA/IMAGES, NOT SYNTHESIZE TWO OR MORE DATA SETS OF TWO OR MORE IMAGES

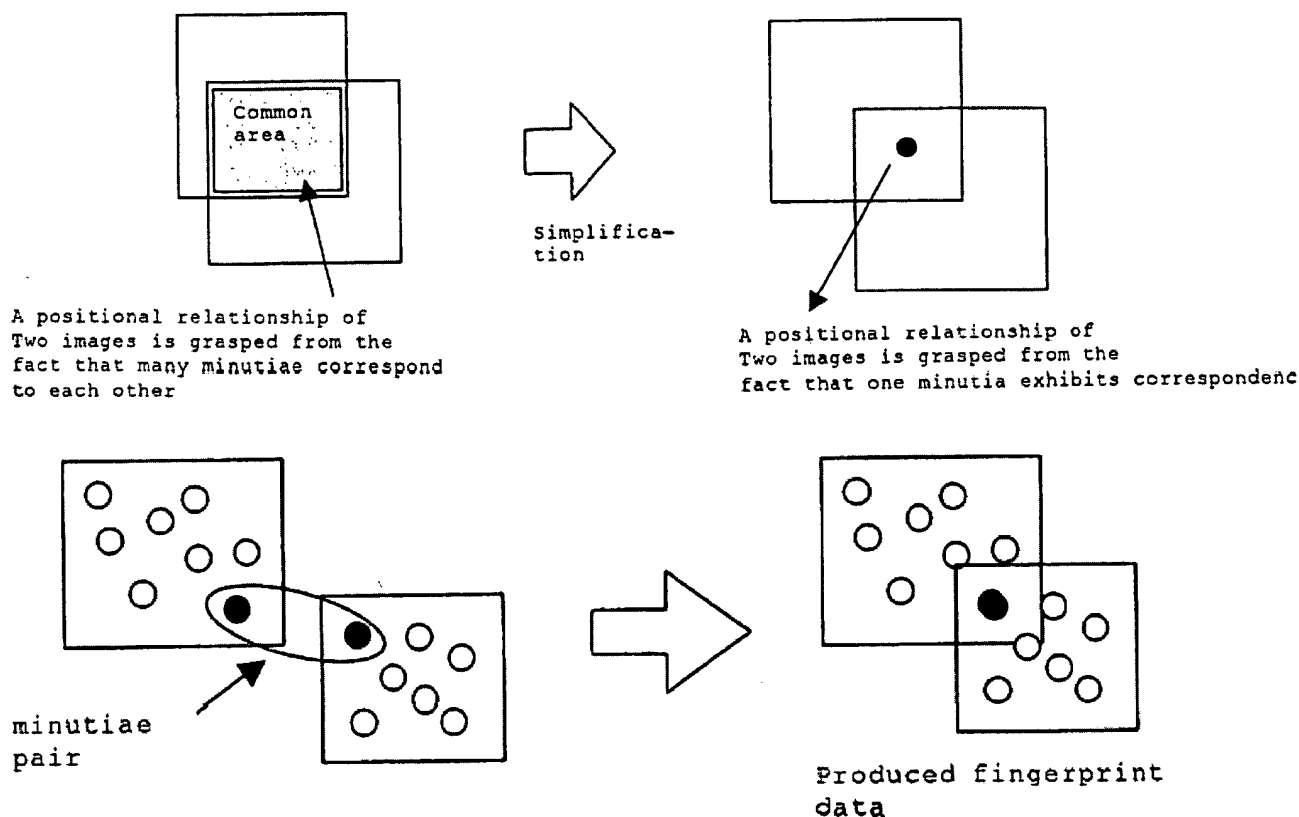
Claim 1 recites "selectively determining which minutiae of the common minutiae to use as representatives of the common minutiae to synthesize the plurality of fingerprint data sets to produce one synthetic fingerprint data set". In other words, among the common minutiae, a minutia from either image/data can selected as a representative (of the same minutia in another

data/image) in the synthetic fingerprint. The result is a synthetic fingerprint data set "comprising minutiae such that each of the two or more fingerprint data sets provide selectively determined minutiae that represent corresponding same minutiae in one or more of the other fingerprint data sets". In other words, the determined representative minutiae are a selective mix of the different fingerprint images/data sets.

As seen in the diagrams below, the purpose of Russo is to combine fingerprint images to form a joined fingerprint. The rejection mentions minutiae extraction in Russo. However, Russo uses minutiae to join fingerprint areas (column 4, line 43). Furthermore, at column 4, line 59, Russo states that "[i]f the number of matching minutiae pairs is sufficient to meet a predetermined number ... the finger print data can be combined with certainty." In other words, a positional relationship of the finger print data 1 and finger print data 2 (see above) can be verified. See also column 4, lines 43 to 67, which discuss a method for combining two fingerprint data by finding overlapping minutiae to combine the other minutiae into a combination of fingerprint data (see the right-hand side of the diagram above).

■Outline of Russo





Claim 1 is different from Russo because claim 1 recites finding common minutiae and selectively determining which of the common minutiae to use as representatives of the common minutiae. Although Russo finds common minutiae, it does not select (from both images/data sets) representative minutiae to represent common/same minutiae. Rather, Russo only teaches representing common minutiae with all of the common minutiae of one set (e.g. the common area of fingerprint data 1 above), or all of the common minutiae of the other set (e.g. the common area of fingerprint data 2 above). See column 11, lines 15-17, and lines 54-56).

Claims 2 and 23 recite "selecting one of the common minutiae as a minutia representative of the common minutiae to synthesize the plurality of fingerprint data to produce one synthetic fingerprint data". Claim 24 recites "selecting one of the common feature elements as a feature element representative of the common feature elements to synthesize the plurality of biometric information to produce one synthesized biometric information". As discussed above, Russo does not select one of common minutiae as a representative minutia, rather Russo uses all of the common minutiae from one image, or all of the common minutiae from the

other image; there is no synthesis by selecting an individual minutia.

Withdrawal of the rejection of claims 1, 2, 23, and 24 is respectfully requested.

VALIDATION: CLAIMS 2, 23, 24, AND 25

The rejection proposed that the validation feature in claim 1 (now in dependent claim 25) is taught by column 5, lines 3-10 of Russo. However, this portion of Russo does not discuss validation but rather discusses *verifying* that an incoming fingerprint image is an image of the same fingerprint represented by the prestored fingerprint data. Verifying a fingerprint is not the same as "validating that the synthetic fingerprint data is valid as fingerprint data" (e.g. claim 25). In other words, because there is a chance that a synthetic fingerprint data may be low quality or unreliable for verification purposes, the synthetic fingerprint data is checked to be sure that it is valid fingerprint data. Russo does not need to do this because it is a simple joining of two data sets that have already been tested for validity. Because it is not a synthesis (in the common area) of minutiae from both images, validity is not likely to be a problem. However, when minutiae from two images are synthesized or combined in a somewhat interspersed fashion, there is chance that relations between the minutiae will be different than in the original data sets.

Claims 2, 23, 24, and 25 recite "validate". The Merriam Webster Online Dictionary defines "validate" as "to confirm the validity of", and "validity" as "being at once relevant and meaningful <a valid theory>". In other words claims * recite in effect confirming that the fingerprint synthesis is relevant and meaningful. This is clearly not the same as using fingerprint data, which is already valid, to determine whether a test fingerprint image matches the fingerprint data.

Withdrawal of the rejection of claims 2, 23, 24, and 25 is respectfully requested.

CLAIM 5

Claim 5 is rejected as obvious in further view of Bolle. The rejection proposes modifying Russo with Bolle to select the minutia representative of the common minutiae based on the

reliability values calculated by Bolle "because the accuracy and reliability of the fingerprint image processing system will be improved". This rejection is traversed because the references do not suggest the precise combination described in the rejection as equivalent to claim 5.

Bolle teaches that reliability is used to "reduce[] the number of unreliable features in the fingerprint by pruning" (column 3, lines 17-20, emphasis added). The techniques in Bolle are tailored to address noise and other artifacts found in an original fingerprint image (column 2, lines 53-61). Bolle also teaches elimination or reducing minutiae "[u]sing an extraction process" (column 3, lines 24-42). In sum, the purpose of Bolle is to eliminate unreliable minutiae - caused by imperfect images - during the minutiae extraction process. Thus, one skilled in the art would look to use Bolle for the purpose of eliminating minutiae during the initial extraction process from an image.

Bolle discusses only the problem of image noise/artifacts creating unreliable minutiae and as a solution Bolle provides detailed techniques for determining reliability during extraction. Bolle teaches identifying unreliable minutiae during the initial minutiae extraction process. Bolle does not mention or suggest selecting a representative minutia of common minutiae, nor does Bolle mention or suggest fingerprint image synthesis or even minutiae thinning any time after the initial extraction process from an image. Bolle concerns processing of only one fingerprint image. Bolle only suggests to one skilled in the art an application of thinning or pruning minutiae for a single image during the initial minutiae extraction process from the image.

Russo addresses only the problem of aligning overlapping fingerprint images. Regarding selection of common minutiae, Russo expressly teaches that "only one common minutia set M1comm or M2comm needs to be used because they represent the same area of a fingerprint" (column 11, lines 53-56; see also column 11, lines 15-17). Russo offers no suggestion or motivation for selectively choosing a representative minutia, nor does Russo suggest or discuss using reliability any time other than at the initial extraction processes 26, 30. Russo completely overlooks the idea that a synthetic fingerprint data set can be created by selecting or selectively choosing representative common minutiae from both sources.

It is respectfully noted that the motive provided for combining Bolle with Russo is to improve "accuracy and reliability of the fingerprint image processing system". However, as discussed above, Bolle improves reliability and accuracy by thinning minutiae during initial

minutiae extraction from an image when image noise and artifacts are of concern. Bolle concerns only improving one fingerprint image. Therefore, any suggestion for fingerprint image synthesis must come from Russo not Bolle. However Russo expressly teaches that "only one common set" is needed, which is the opposite of selective representation.

While it is correct that selecting a representative minutia based on reliability does have a benefit of improving accuracy and reliability, this benefit is not suggested by any prior art. The benefit becomes apparent only when the references are combined as mentioned by the rejection. However, a prima facie case of obviousness cannot be established based on a benefit apparent only after prior art references are combined. The motive for combining the references must come from the uncombined prior art; it cannot come from a combination of references, which is not actually prior art. In other words, it is improper to combine references and then claim that one would be motivated to combine the references because of an apparent benefit found in the combination; the combination itself is not prior art.

When the motives provided by the individual uncombined references are considered, it is apparent that there is no suggestion or motive in the prior art to combine Russo and Bolle in the precise manner proposed by the Examiner. As mentioned above, Bolle only solves a problem of avoiding unreliable minutiae when extracting the minutiae of one image that has noise and artifacts. Russo only solves a problem of how to align two images and does not suggest that there is a need to improve the set of common minutiae. Because neither reference discloses or suggests a synthesis process where minutiae are *selectively chosen* from among common minutiae of two different images to represent the same common minutiae, one skilled in the art would not have been motivated to apply Bolle for fingerprint synthesis.

More likely, given Bolle and Russo, one skilled in the art would have applied Bolle to address noise in the images 22 and 24 at the extraction stages 26 and 30 of Russo (see Figure 2), because this is the problem that Bolle solves and the explicit stage at which it solves it. Russo invites this non-analogous combination when it suggests "using any known methods" for minutiae extraction (column 5, lines 44-50). Furthermore, because Russo needs to compare minutiae of two different images, presumably unreliable minutiae (due to image noise etc. as concerns Bolle) have already been eliminated. There is no suggestion in Russo that further elimination (due to image noise per Bolle), after the initial extraction and during alignment, is necessary or beneficial.

In sum, the combination of Bolle with Russo is traversed because (1) to the extent that the motive to combine comes from the references, the references do not provide sufficient motive to combine the references for post-extraction selective image synthesis, and (2) to the extent that the motive to combine comes from the references after they have been combined, the motive is improper because it is not provided by the prior art.

Withdrawal of the rejection is respectfully requested.

CLAIMS 3 AND 4

Russo counts the number of common minutiae in order to determine whether or not the decision of a common area is sufficient. According to claims 3 and 4, the number of common minutiae are counted in order to decide whether or not fingerprint data after synthesis is valid. Withdrawal of the rejection is respectfully requested.

CLAIM 21

According to Russo, "In one embodiment, the neighbor minutiae are selected such as to maximize the spread around the center point, i.e. minutia j.". The rejection asserts that positioning around the center point is the same as "positioning of the minutiae from which the synthetic fingerprint data are produced with reference to the center of a fingerprint, as recited in claim 21. However, the "center point" of Russo is a point that is merely referred to formally as such but which actually is the "minutia j". What Russo means is that the "minutia j" is positioned in the neighbor area. "The center of a fingerprint" in claim 21 refers to the core of a fingerprint (e.g. a convolutional/semicircular shape of a fingerprint pattern).

Although Russo uses the term "center", "center" refers to the center of a *set of neighboring minutiae*. This is clearly not the same as the "core of a fingerprint". Withdrawal of the rejection is respectfully requested.

CLAIM 22

In claim 22, common minutiae are found from among minutiae already produced by fingerprint synthesis; positioning is performed based on the common minutiae. In other words, there is a countermeasure for a case when, during synthesis, common minutiae are not found in all of the fingerprint images (data sets).

Russo describes the simplest case of only one common pair. This is a simplified description of verification of common areas. This does not apply to the description above of claim 22.

Russo does not state that when a large number of common minutiae are found, one of them is selected and used for positioning. Rather, Russo states that when a large number of common minutiae are found, the accuracy is high. As stated in column 4 line 59, "If the number of matching minutiae pairs is sufficient to meet a predetermined number", only one pair does not actually allow positioning and does not actually allow functioning.

Withdrawal of the rejection of claim 22 is respectfully requested.

DEPENDENT CLAIMS

The dependent claims are deemed patentable due at least to their dependence from allowable independent claims. These claims are also patentable due to their recitation of independently distinguishing features. For example, 16 recites that "said minutia reliability calculation section calculates the number of times of verification coincidence of each of the minutiae as the verification coincidence evaluation value". This feature is not taught or suggested by the prior art. Withdrawal of the rejection of the dependent claims is respectfully requested.

NEW CLAIMS

New claims 26-30 have been added to provide an alternative way of claiming the production of a synthetic fingerprint by selectively determining which common minutiae from one set or the other to be used as a representative minutiae. This feature is in slightly different language

is discussed above.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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